MinnKota Cyclone

National Weather Service
WFO Eastern ND/Grand Forks **Spring/Summer 2001**

Our mission is to provide continuous hydrometeorological products and services, including accurate and timely forecasts and warnings, to the people of eastern North Dakota and northwest Minnesota.

Extreme Weather Events Across Eastern North Dakota and Northwest Minnesota

By Jonathan Brazzell
Meteorologist

As you may or may not know, North Dakota and Northwest Minnesota communities are no strangers to disastrous weather events. I was tasked to come up with some of the more memorable events. When I started taking on this task, I was amazed at the amount of significant weather events that I could come up with. Even though winter weather is the biggest threat to life in the northern plains, in this article I will examine some of most significant summer severe events, since the summer storm season is just around the corner. some of the events you may even remember and others you will not.

To begin with, our area is not immune to the types of tornado outbreaks that are experienced in the central and southern plains. The deadliest tornado ever recorded in our area occurred way back on June 22, 1919 in Fergus Falls, Minnesota. This tornado roared into Fergus Falls around 4 p.m. killing 57 people and injuring 200 others. Photos of the damage show that a good portion of the town was leveled by the tornado and would have probably been rated an F-5 on the Fujita scale had the tornado occurred in modern times. Reports indicate that the tornado was approximately 400 yards in width and was on the ground for 20 miles. There were about 400 buildings destroyed including 228 homes. Lumber was carried 10 miles away, and a blank check was found as far away as 60 miles. Along with being the deadliest tornado, it appears to be the single most deadly weather event to strike our area.

A tornado near Devils Lake, ND in June 1999. Storms like these can occur in our area during severe weather season which is generally June through August.

The second deadliest tornado touched down at Fargo, North Dakota on June 20, 1957. This tornado occurred around 6:30 p.m. and was the third tornado in a family of five tornadoes that raked across Cass County, North Dakota and Clay County, Minnesota that day. The tornado at Fargo was on the ground for 9 miles and was about 400 yards in width. The tornado claimed 10 lives and injured over 100 others. The tornado also damaged 1300 homes. The highest wind speed ever recorded in North Dakota of 115 m.p.h. occurred as the tornado passed near the weather instruments located at Hector Field in north Fargo. The Fargo tornado was also studied by the renowned tornado scientist Dr. Theodore Fujita, the

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Significant Weather

When Seconds Count...StormReady Communities Are Prepared!

By Robin Turner
Senior Meteorologist

Ninety percent of all presidential declared disasters are weather related, leading to around 500 deaths per year and nearly $14 billion in damage. To help Americans guard against the ravages of severe weather, the National Weather Service has designed StormReady, a program aimed at arming America's communities with the communication and safety skills necessary to save lives and property.

About StormReady

StormReady prepares communities with an action plan that responds to the threat of all types of severe weather -- from tornadoes to tsunamis.

The entire community, from the mayor, emergency managers, to business leaders and civic groups, can take the lead on becoming StormReady. Local National Weather Service forecast offices work with communities to complete an application and review process. To be officially StormReady, a community must:

- establish a 24-hour warning point and emergency operations center;
- have more than one way to receive severe weather forecasts and warnings and to alert the public;
- create a system that monitors local weather conditions;
- promote the importance of public readiness through community seminars; and
- develop a formal hazardous weather plan, which includes **training severe weather spotters** and holding emergency exercises.

StormReady Recognition Process

An advisory board, comprised of National Weather Service meteorologists, and state and local emergency managers, will review applications from municipalities and visit the locations to verify the steps made in the process to become StormReady. StormReady communities must stay freshly prepared, because the designation is only valid for two years.

Is Your Community StormReady?

For complete details on the StormReady program, contact your local Emergency Manager, or visit our website: www.crh.noaa.gov/fgf/stormready/stmrdy.html.

AHPS Fever

By Mike Lukes
Service Hydrologist

AAHPS@. AGesuntheit@. Something has been going around the Red River Valley this spring, since we rolled-out the Advanced Hydrologic Prediction Services in January.

So, just what is this AHPS?

The Advanced Hydrologic Prediction Services is an improved way to gather, analyze, predict, and disseminate river and water information. It is a convergence of new observational capabilities, and more powerful computers coupled with improved communication technologies. These technologies applied to new ideas in hydrologic science are then incorporated into more complex and sophisticated models which more closely represent the physical processes, along with top-to-bottom dedication of resources to the hydrologic problem to produce better river and stream predictions. AHPS is a package of services that will provide information on expected river conditions from short-range flood hydrographs to long-range probabilistic outlooks.

What can it do for me?

AHPS provides you more detailed water information earlier, that covers longer time periods, over the internet (World Wide Web). This information is given monthly for all 33 river forecast points contained in the Red River of the North=s basin, as well as for Creel Bay at Devils Lake. The business end of AHPS provides the following products: 90-day Probability of Exceedence graphs for River Stage, Flow and Volume; 14 week series of weekly Probability of Exceedence graphs for River Stage and Flow; River gage information, its mapped location, and the expected impacts of various stages on the river locality; a link to the current gage reading; and, when in flood, a 5-day forecast hydrograph. This information will enable the user to make better informed decisions as to what action to take when flood water threaten.

Probabilistic?

In 1770, Voltaire wrote ADoubt is not a pleasant condition, but certainty is Absurd@. This condition is implicitly recognized in AHPS by associating predicted river stages with a probability of exceedence. The process starts with current soil, river, and snow condition data maintained by the

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AHPS

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scientist who developed the tornado intensity scale that is used to classify tornadoes today. By studying this tornado he developed many of the concepts of thunderstorm structure and tornado development that we take for granted today. The most significant finding from his study was that tornadoes can occur in families or numerous tornadoes can form from a single thunderstorm. Previous to his findings a single long tracked tornado was thought to have traveled more than 20 and even as much as 80 miles without dissipating, but today we know that tornado tracks of over 20 miles are very rare from a single tornado. Even the Fargo tornado was initially listed as a single 30 mile long tornado that went from near Buffalo, North Dakota to between Hawley and Detroit Lakes, Minnesota. Debris from Fargo was blown as far away as Detroit Lakes. The tornado would later be classified as an F-5 on the Fujita scale. Included in the tornado family was an F-4 , the fourth tornado in the family, which developed near Glyndon, Minnesota and lifted near Hawley. The fifth tornado touchdown northeast of Hawley and lifted just northeast of Dale, Minnesota and was rated at an F-3.

A more recent outbreak of tornadoes occurred on June 6, 1999. This weather event stands out, not for being one of the deadliest tornado outbreaks, but for the number of tornadoes that occurred in a single day in North Dakota. The Number of tornadoes that occurred was around 20 in North Dakota alone and another was reported in Roseau County, Minnesota. It is difficult to say exactly how many tornadoes occurred that day, because numerous storm spotters reported seeing two and three tornadoes at one time. This tornado outbreak included three significant tornadoes, which were rated at F-2 or higher. The most significant tornado, was the one that struck the community of Mountain, North Dakota. This tornado was rated at an F-4 and leveled homes in the community of Mountain. This tornado was the strongest tornado to strike North Dakota since 1978.

Another severe summertime weather event that is fairly common in this area, is long lived straight line wind events or as they are called in the meteorology community derechoes. A derecho can be just as bad or worse than a tornado, because they can cover a much broader area. These storms can reach up to an F-2 tornado intensity and many people who go through them think that it is a tornado. These storms are so long lived that they can travel from the high plains all the way to the Atlantic coast producing widespread damage. A derecho produced the highest wind speed ever recorded in Minnesota of 117 m.p.h. at Alexandria on July 19, 1983. July 12-14 in 1995 was a particularly active period for derecho activity as three such wind storms moved through North Dakota and Minnesota three consecutive nights in a row at almost the same time. The first derecho moved into southeastern North Dakota around 2 a.m. on the 12th and produced damaging winds in excess of 80 m.p.h. There was extensive damage to the roof of the Fargodome and many other homes lost roofs that night in southeastern North Dakota. This storm moved into Minnesota shortly after 2 a.m. and produced damage in the Rothsay, Minnesota area. These storms continued to produce wind damage across northern Minnesota through the early morning hours and reached the Duluth, Minnesota area around 6:30 a.m. where it produced extensive wind damage. The very next night and about the same time frame, another derecho moved through the region and caused extensive damage primarily in west central Minnesota. In the town of Hawley, numerous roofs were blown off of houses. In the early morning hours of the 14th, yet another derecho moved through the region causing more damage. Lake Itasca State Park was hard hit in all three storms and over 5 million trees were blown down, which was worth $15.5 million.

Another more recent derecho occurred on July 4, 1999. This storm began near the Fargo area, where winds were estimated at over 120 m.p.h. or as high as an F-2 tornado. This storm produced extensive structural damage in the Fargo/Moorhead area. This derecho then progressed east causing more extensive damaged in the Boundary Waters Canoe Area. Numerous campers with injuries were trapped as fallen trees blocked roads getting in and out of the area. This area is still under the potential threat from large fire due to the numerous fallen trees from this storm.

On August 11, 2000, a derecho moved across North Dakota during the evening hours and reached the Devils Lake, North Dakota community around midnight, where the Law Enforcement Center reported a 110 m.p.h. gust. This storm damaged numerous buildings and trees around Devils Lake. After raking through Devils Lake the wind forced a car off the road a short while later in Walsh county. The derecho later weakened in northwest Minnesota around 3 a.m.

Summertime flash floods are not that common across eastern North Dakota and northwest Minnesota due to the flat terrain of the area, but on occasion as we learned in June of 2000, they do happen. Last year we seen two flash flood events occur one week apart. The first event occurred when 15 to 20 inches fell across western Grand Forks county. These heavy rains sent the Turtle river out of its banks within a matter of hours from Arvilla, North Dakota to Meckinock, North Dakota. It also washed away roads and two young men lost their lives when the vehicle they were riding in went into a 20 foot deep road washout. A week later the Fargo area received 6 to 8 inches of rain that overwhelmed the sewer system and flooded many homes and businesses in a matter of hours.

Hopefully this article gave you a little flavor of what we can expect for severe weather in the summertime. In the fall, I will take a look back at some of the significant winter weather events.

Update on NOAA Weather Radio

By Dave Kellenbenz
Meteorologist

The NOAA Weather Radio (NWR) program has undergone many changes in the past year. Listeners of NWR over the last several years have been introduced to our newest voice, locally called Ole. Ole is a computer generated voice who helps us continuously broadcast weather information once a forecast or other product is issued. In the past, a staff member had to manually record forecasts and local conditions on NWR, which was time consuming. Since the advent of Ole, the staff at Grand Forks has been able to pursue other things during their free time, such as case studies and meteorological research.

Since his inception, Ole had only been broadcasting routine weather products, or non-warning and watch products. Therefore, when a severe thunderstorm warning was broadcast over the NWR, a human voice manually aired the warning. The new policy at all National Weather Service offices around the country for this and all upcoming years is to have Ole put the warnings out, once issued by the NWS field offices. This will lead to warnings getting out quicker on NWR to the public, which will increase the reaction time for people in the path of potentially dangerous situations. This will ensure that the warnings get out as soon as possible, once being processed by Ole's computer. In the event that a computer failure occurs once a warning is issued, and Ole was unable to issue a warning, a human would then air the warning on NWR. For this reason, someone will always monitor Ole during severe weather events to make sure he is doing his job.

Other changes that will be upcoming during the next year or two will be an improved voice for Ole. His voice will become a concatenated voice, which will be an improvement over his current voice. This voice will be derived from a human voice, so it sounds more like a real person. Anyone who wants to listen to a few clips of a concatenated voice, or get other general information about the NWR program can log on to our web page at www.crh.noaa.gov/fgf/nwrmain.htm.

In addition, more transmitters will be coming on line in Minnesota over the next year, in order to increase NWR coverage. Proposed sites are near the following: Fergus Falls, Lake Bronson, and Twin Valley. The wattage at the Bemidji, MN site will also be increasing to 1,000 kw in the near future, which will increase the coverage in this area.

Be sure to keep listening to NWR this severe weather season and throughout the year, to stay informed of all the latest weather information from your National Weather Service.

Electronic Technicians and River Gages

By Terry Decker
Electronics Technician

The Eastern North Dakota Weather Forecast Office (WFO Grand Forks) Electronics Team is a vital part of the day-to-day forecasting operations. The team is responsible for maintaining several systems located at the Forecast Office and 27 other sites within the County Warning Area (CWA). These systems include, but are not limited to the Advanced Weather Information Processing System (AWIPS), WSR-88D Doppler Radar, Automated Surface Observing Systems (ASOS), NOAA Weather Radio transmitters, and river gages. The team is managed by our Electronics System Analysis, Mike Lukasz and includes two Electronic Technicians, Ed Schulz and myself.

Like most jobs, our work is dictated by priorities. With the spring thaw, hydrological equipment (river gages) becomes very important. You might have seen these gages during your travels or might have one located in your town. Some are located in a gray metal cabinet near a bridge and have a solar panel mounted on a pole above it. Others are located in a wooden box that sits on top of a large galvanized vertical pipe. All 14 river gages maintained by this office operate and are monitored for accuracy throughout the year. A preventive maintenance inspection is performed on each gage site during the spring and fall. During the inspection the gage is calibrated, tested for accuracy, serviced, and cleaned.

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El Techs and River Gages
(continued from page 4)

There are two different types of river gages maintained by our office. Both of these systems are highly accurate. The first type employs an air tube from the gage to the river. Air is pumped into the tube by a small compressor. Stage height is computed by the amount of pressure required to continuously release one bubble per second. As the river rises or falls the pressure changes and the computer determines the river height. Stage data is transmitted to a satellite once an hour and then relayed to computer systems at the Weather Service and other agencies. The computed river stage is also manually verified by the use of a Wire Weight attached to the bridge.

The second type of gage uses a well and float to determine a river stage. A pipe extending from the well to the river allows the water in the well to fluctuate with the river stage. The float is attached to a thin cable that turns a sensor (encoder). Data from the sensor is sent to a data collection platform where it is read out across a modem and phone line.

Much of the information from these gauges can be accessed via the internet at several web sites. Some of these include:

http://www.mn.cr.usgs.gov/rt-dnr-cgi/gen_tbl_pg

http://mn.water.usgs.gov/rt-cgi/gen_tbl_pg

http://www.mvp-wc.usace.army.mil./

I hope you have enjoyed learning a little more about how the electronic technicians at WFO Grand Forks help keep the river gages running smoothly across northwest Minnesota. In a later issue of the Cyclone, we'll try to detail some of our duties, including how we maintain the Automated Surface Observing Systems (ASOS) and the WSR 88D Doppler Radar.

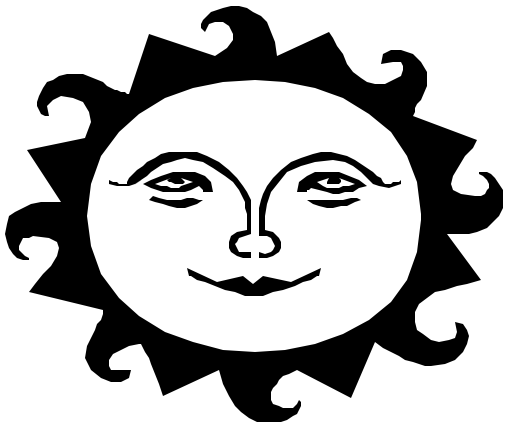
The Summer 2001 Electric Field Outlook

By Mark Ewens
Data Acquisition Program Manager

There are a great many factors which influence the ability of scientists to accurately predict the weather over several months. An exact understanding of the atmospheres interaction with the oceans is one. Another, even less understood interaction is that of the variations of solar and geomagnetic influences. Since the atmosphere is composed of several gasses which are electrically charged in nature, theory suggests that the daily, weekly and seasonal variations in the solar/geomagnetic field would affect the weather.

It is this basic theory which drives the electric field based outlooks. Research done at the NWS Office in Grand Forks further suggests that patterns in the electric field can be useful in determining long range weather prediction. Using simple mathematical formulas and statistics, comparisons between the monthly average electric field and monthly average temperature become apparent. To this end, the variations in the electric field can foreshadow the trend in temperatures and precipitation.

Based on these ideas, the electric field-based outlook for the summer 2001 (for the Grand Forks area including Thompson, Emerado, Fisher and Manvel) is for a drier summer than recent years, or at least fewer intense rainfall events. Temperatures will average above normal, by perhaps 3 to 8 degrees. Overall confidence in this outlook is fair.

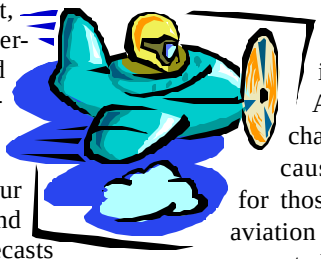


Aviation Weather Services Provided by WFO Grand Forks

By Dave Soroka
Meteorologist

Aviation is a multi billion dollar industry in the United States, with thousands of commercial and private planes traversing the sky every day. The safe and effective movement of all of these people and goods could not be accomplished without the critical assistance of several Federal Agencies. Among them is your National Weather Service, solely responsible for providing hundreds of thousands of aviation weather forecasts each year. Meteorologists working 24 hours a day/7 days a week in nearly 120 Weather Service Forecast offices as well as the Aviation Weather Center in Kansas City, Missouri keep the nation's airlines and general aviators safely airborne, avoiding turbulence, high speed jet level winds and icing dangers and then ease them back to the ground via Terminal Forecasts and Transcribed Weather Broadcasts detailing conditions at over 500 nationwide airports.

Warnings of flight hazards such as turbulence, icing, low clouds and reduced visibility remain most critical for the protection of life and property over the United States from the earth's surface up to 24,000 feet. Above 24,000 feet, the emphasis shifts to providing warnings of dangerous wind shear, thunderstorms, turbulence, icing and volcanic ash. Local National Weather Service offices (like yours in Grand Forks, ND) provide Terminal Aerodrome Forecasts (TAFS) for several airports within their County Warning Area (CWA). Our office issues these forecasts for the airports in Grand Forks, Fargo and Bemidji. These are specific forecasts that cover a 24-hour period and include wind direction and speed, visibility, type of weather (precipitation, fog, haze...) amount and height of cloud cover, and possible low level wind shear.



TAFS are sent out on a scheduled basis four times daily, and amended as necessary according to a strict criteria of changing weather conditions. The TAF is expected to accurately portray the conditions indicated within a 5 mile radius of the airport. Some TAFS include TEMPO or PROB groups, which are utilized to show conditions varying across the area, which may include periodic showers, intermittent cloud cover or gusty winds for just an hour or so. Other groups such as FM or BECMG indicate more permanent changes to the weather conditions.

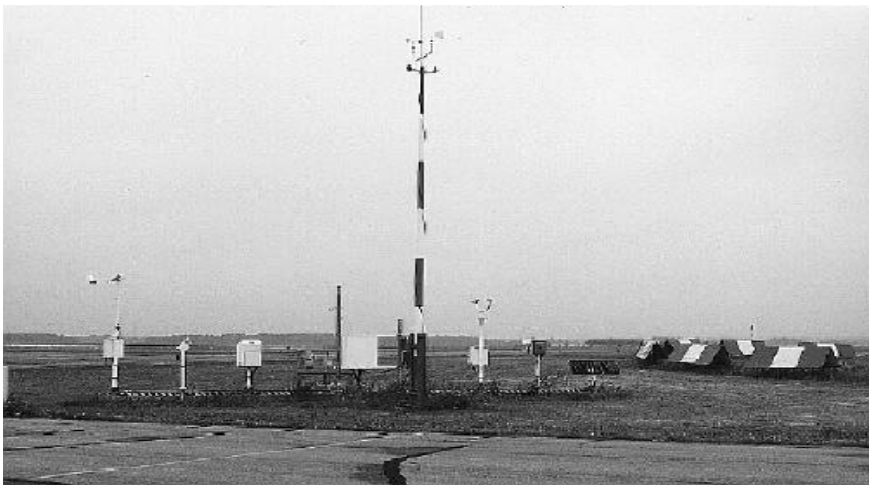
Another important aviation forecast issued from our office is the Transcribed Weather Broadcast (TWEB). These are route forecasts, connecting several TAF sites along an area that can cover several hundred miles. The forecast in the TWEB is expected to accurately portray conditions on a 50 mile wide span (25 miles on either side of the TWEB route). The TWEB is a more general look at conditions important to aviation interests, and is actually broadcast via in-plane radio communications. Again, these forecasts are issued four times daily and updated as necessary and include sky cover, precipitation and winds when they are significant. Our office issues four TWEB route forecasts - two covering parts of Eastern North Dakota and two for Minnesota. One of our North Dakota TWEBS covers the area from Bismarck to Fargo, and the other from Fargo to Winnipeg. In Minnesota, we have a route from Minneapolis to Fargo, and the other from Duluth to Fargo.

Another very important aviation weather product that our office is tasked with issuing is a detailed accident report for the National Weather Service Central Region Headquarters in Kansas City, MO in the event of an aircraft accident. These reports are critical in determining if weather had played a role in the accident, and also indicates if our forecast was representative at the time of the crash. These reports may eventually find their way to National Transportation Safety Board officials investigating the crash. Many of the accidents in our area occur in crop dusters, and other small privately owned vehicles flying at very low altitudes. Unfortunately, others occur when pilots venture out into weather conditions that they are not accustomed to, or in fact not legally qualified to be traveling in. As we all know, weather conditions can change quickly, and the danger that this may cause persons on the ground is magnified greatly for those in the air. Therefore, providing accurate aviation forecasts, and then amending quickly when unexpected changes occur is critical to the mission of the National Weather Service. Also, it is crucial to obtain a weather briefing from an area Flight Service Station before taking off. These stations are staffed with weather specialists that utilize National Weather Service forecasts and relay a detailed weather report to prospective pilots.

Finally, it is important that forecasters in our office coordinate with surrounding weather service offices, the Grand Forks and Minneapolis Flight Service Stations and meteorologists at the Aviation Weather Center in Kansas City to ensure a seamless suite of aviation products. By now, you understand how your local Weather Service office plays in an integral role in keeping the nation's airways safe and sound. In a later edition of the cyclone I'll detail some of the products issued by the Aviation Weather Center, and explain how they compliment those issued by our office. Until then, here's to happy and safe flying!

NWS Weather Equipment

By Vince Godon
Meteorologist



Have you ever driven by a piece of weather equipment and wondered what its purpose was or who put it there? The National Weather Service (NWS) is one of many different agencies that have weather reporting equipment across eastern North Dakota and northwest Minnesota.

The NWS fields human observers as well as computerized observation systems to monitor the weather. Human observers are part of the cooperative observer network, and are scattered about by roughly one or two per county. The oldest station in this area is the UND station, which has records dating back to 1890. This equipment is now situated outside the NWS in Grand Forks, who assumed this observing function after opening in 1996.

If you passed by one of these stations, you would definitely know it. Most cooperative observers have a white, missile-looking raingauge in their yards. Cooperative observers also have a maximum and minimum thermometer and some also have a manual reading raingauge.

Computers are the wave of the future in weather observing. NWS and Federal Aviation Administration (FAA) human observers at major airports continue to be replaced with automated equipment. In North Dakota, the only human weather observers left are at Minot, Dickinson, and the Minot and Grand Forks Air Force Bases. All the other main airports log weather conditions through the Automated Surface Observing System, or ASOS.

ASOS is a group of automated sensors that report temperature, precipitation, wind, sky condition, pressure, and visibility. This sensor group is normally located near the landing zone of the primary runway. ASOS:s are located at Fargo and Grand Forks, ND, and at Park Rapids and Baudette, MN.

The FAA installed a system called AWOS, or the Automated Weather Observing System, at many smaller airports. AWOS systems were installed at Devils Lake, Fergus Falls, Roseau, Bemidji, and other smaller airports in this area. The AWOS system is designed like an ASOS, but is targeted more to aviation interests. ASOS and AWOS information can be found at: **http://weather.noaa.gov/index.html**

North Dakota and Minnesota Departments of Transportation installed multiple weather stations across each state that monitor road and weather conditions. These RWIS stations, or Remote Weather Information Systems, have popped up along interstates and other roadways across the area. In North Dakota, many people have noticed the station along Interstate 29 on the railroad overpass near Mayville. Many more of these stations exist in Minnesota.

These stations help both states plan their resource use and identify problem areas for transportation. The weather stations monitor road temperature, air temperature, and wind. The wind towers are often the most visible, standing about 30 feet high. RWIS information can be found at: for MN: **http://rwis.dot.state.mn.us/** OR for ND: **http://rwis.dot.state.nd.us/**

North Dakota State University and the ND State Climatologist also have a network of weather stations set up across the northern plains, with a focus on eastern North Dakota. These NDAWN stations, or the North Dakota Agricultural Weather Network, are geared toward agricultural interests. These stations track temperature, humidity, precipitation, and wind. NDAWN information can be found at: **http://www.ext.nodak.edu/weather/ndawn/**

Across the forested areas of Minnesota and the grasslands of southeast and central North Dakota, land management agencies recognize a fire potential for a large area. Therefore, Remote Automated Weather Stations (RAWS) measure temperature, wind, and humidity for fire weather interests. RAWS information can be found at: **http://raws.boi.noaa.gov/rawsobs.html**

In addition to these sources of weather information, there are also other human and computerized weather networks. Several television stations employ human observers that call in temperature and precipitation reports. Other stations have computerized weather stations at schools or weather cameras mounted on towers for internet viewing.

As you can see, there are many sources of weather information. However, in the shift toward computers and automation, there are some important weather elements computers cannot measure. Snowfall, snow depth, liquid equivalent of snow, tornadoes, and hail are several examples of what these computerized systems do not measure. That is why the NWS relies on cooperative observers and trained weather spotters to fill in the gaps.

Thunderstorms and Lightning Go Hand in Hand

By Greg Gust - Warning Coordination Meteorologist

For most of us in the upper Midwest, late spring and summertime events are usually outdoor activities. Children, and the many individuals involved in outdoor sporting activities such as fisherman and golfers, are particularly at risk in a thunderstorm. If you can see the lightning or hear thunder you may already be too close.

The States of Minnesota and North Dakota have each declared a ASevere Weather Awareness Week@ to help educate citizens on the dangers of severe summer weather which includes flash flooding, tornadoes, hail, wind, wildfires and lightning.

Minnesota - April 16 - 20th. (Tornado Drill Date, April 19th)
North Dakota - April 30 to May 4th. (Tornado Drill Date, May 3rd)

Thunderstorms are very common across the area during the late spring and summer months. Lightning is perhaps the most spectacular phenomenon associated with thunderstorms. Most lightning deaths and injuries occur when people are caught outdoors, most often in the summer months and during the afternoon and early evening.

The typical thunderstorm is 10-15 miles in diameter and lasts an average of around 30 minutes. Despite their small size, thunderstorms are dangerous. Lightning can strike the ground up to ten miles away from a thunderstorm. Every thunderstorm produces lightning which kills more people each year than tornadoes. Heavy rain from thunderstorms can lead to flash flooding. Strong winds, hail, and tornadoes are also dangers associated with some thunderstorms.

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Sacramento Soil Moisture Accounting and Snow Models run at the North Central River Forecast Center at Chanhassen, MN. These conditions are coupled with seasonal time-series of temperature and precipitation for 49 years (1949-79) which are adjusted for the climate projections and run through the Ensemble Streamflow Prediction model to produce 90-day hydrographs for the 49 cases used. To get the probability of exceedence (POE) for the period, high water values within the 90-day period for each case are gathered and then ranked from lowest to highest. Since each value represents about 2% of the 49 cases, and for the lowest value, 98% of the cases have water higher than it, its associated POE would be 98%. This method is also used for the weekly time-series POE with only the values within that week.

First in the Nation for Basin-wide Implementation.

The Grand Forks WFO has been chosen to be first in the nation to switch to AHPS basin-wide. AHPS has been applied to headwater areas of other river basins in the mid-west and will be implemented nation-wide over the next 5 to 10 years. The AHPS technology will also be applied internationally as other nations see the need for improved hydrologic forecasting. So if you want to see the future now, you can Acatch@ the AHPS fever at:

www.crh.noaa.gov/fgf/ahps/ahpsmain.htm

National Weather Service Cooperative Observer – A Perspective

By Mark Ewens
Data Acquisition Program Manager

The National Weather Service (NWS) has been tasked with the issuance of severe weather watches and warnings designed to protect life and property. To this end, the collection of timely and accurate surface weather data is vital. In addition to the protection of life and property, the Department of Commerces' National Oceanic and Atmospheric Administration (of which the NWS is a part) has been given the job of maintaining a database of climatic weather information. This too is used by the NWS in preparing medium and long range forecasts.

These two jobs have the *Cooperative Observer Program* - Co-Op Program in short- in common. The Co-Op Program is the backbone of the United States Climatological database. Co-Op observers frequently act as both severe storm spotters, phoning in reports of hazardous weather in the winter and summer.

What is the job of a Co-Op observer?

Being an NWS Co-Operative observer can be a demanding job. To provide accurate and complete weather data, observations are required seven days a week, 365 days a year. This does not mean that someone has to be monitoring the "weather" all the time; instruments are provided to monitor temperature and precipitation. Yet someone should be available to **record** the daily maximum and minimum temperature, the precipitation, and snowfall. This generally is done around 7 a.m., but observation times can be shifted to fit the observers schedule.

This information is recorded on a form which is mailed monthly to the local NWS office for quality assurance before forwarding to the National Climatic Data Center (NCDC) in Asheville, North Carolina.

What equipment do I use?

Depending on the level of service expected, equipment can vary from a simple 8 inch non recording plastic or metal rain gage to a full coop station with electronic thermometer and recording precipitation gage. The placement and type of Cooperative Weather Observers (CWOs) is determined by the NCDC as requested by the NWS Representative (NWSREP). Generally cooperative stations are evenly spaced in relatively flat terrain (more than 30 miles apart) but may be closer together in hilly terrain or under special circumstances. Most common are the AC@ order station which support real and near real time severe weather operations. Typically these are CWOs who have had Severe Weather Spotters training and have a non recording raingauge. AA@ and AB@ order stations are for longer term climatological and hydrologic operations and have less contact with a NWSREP.

The NWSREP will deliver, set up and maintain the necessary equipment. Typically, the Co-Op station consists of a set of Maximum/Minimum thermometers or a Max/Min Temperature System (MMTS) and a raingauge. There are two basic types of rain gages - recording and non recording. Non-recording rain gages consist of a metal tube approximately 8 inches in diameter and 3 feet tall with a removable funnel and inner plastic or metal measuring tube. Precipitation is measured by placing a calibrated stick into the tube, seeing where the water marks the stick and recording the data.

A recording rain gage has either a drum which holds a paper chart or a drive mechanism which punches holes in a strip chart to record precipitation. At the end of each month, the charts are forwarded to the local NWS office for QA then forwarding to NCDC.

What happens with the information I collect daily?

Data can be transmitted to the local NWS office via telephone, using a PC based system called PC-ROSA, an Internet Based program, or data can be called in on a voice system. This near real-time data is used to support the day-to-day operations of the NWS in its forecast and warning decisions.

What kind of training is involved?

Training consists of on-site, hands-on instruction with the designated Co-Op Observer and their backup. This usually is done the same day as the equipment is installed and takes about one hour. If necessary, additional training may be provided upon request. Basic equipment maintenance is discussed and the Co-Op observer is provided with a name ("point of contact") and a number should

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Cooperative Observer

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additional questions or problems arise.

If you have additional questions, please call Mark Ewens at 701-772-0720 ext 327. Mark is the Data Acquisition Program Manager for the National Weather Service Eastern North Dakota Office in Grand Forks. Or write Mark at:

National Weather Service
4797 Technology Circle
Grand Forks ND 58203-0600

or visit us on the Internet at:
www.crh.noaa.gov/fgf/coop.htm

Meteorologist Jonathan Brazzell does some work on a Fischer Porter rain gage.

William Landby , Cooperative Observer in Warroad, MN re-ceives a 30-year award from the Department of Commerce.

Lightning Safety Rules National Oceanic and Atmospheric Administration (NOAA)U. S. Department of Commerce

- **Stay indoors, and don't venture outside, unless absolutely necessary.**
- **Stay away from open doors and windows, fireplaces, radiators, stoves, metal pipes, sinks, and plug-in electrical appliances.**
- **Don't use plug-in electrical equipment like hair dryers, electric toothbrushes, or electric razors during the storm.**
- **Don't use the telephone during the storm. Lightning may strike telephone lines outside.**
- **Don't take laundry off the clothesline.**
- **Don't work on fences, telephone or power lines, pipelines, or structural steel fabrication.**
- **Don't use metal objects like fishing rods and golf clubs. Golfers wearing cleated shoes are particularly good lightning rods.**
- **Don't handle flammable materials in open containers.**
- **Stop tractor work, especially when the tractor is pulling metal equipment, and dismount. Tractors and other implements in metallic contact with the ground are often struck by lightning.**
- **Get out of the water and off small boats.**
- **Stay in your automobile if you are traveling. Automobiles offer excellent lightning protection.**
- **Seek shelter in buildings. If no buildings are available, your best protection is a cave, ditch, canyon, or under head-high clumps of trees in open forest glades.**
- **When there is no shelter, avoid the highest object in the area. If only isolated trees are nearby, your best protection is to crouch in the open, keeping twice as far away from isolated trees as the trees are high.**
- **Avoid hilltops, open spaces, wire fences, metal clotheslines, exposed sheds, and any electrically conductive elevated objects.**
- **When you feel the electrical charge -- if your hair stands on end or your skin tingles -- lightning my be about to strike you. Drop to the ground immediately.**

PERSONAL LIGHTNING SAFETY TIPS

*1.**PLAN** in advance your evacuation and safety measures.* When you first see lightning or hear thunder, activate your emergency plan. Now is the time to go to a building or a vehicle. Lightning often precedes rain, so don't wait for the rain to begin before suspending activities.
*2.**IF OUTDOORS...**Avoid water. Avoid the high ground. Avoid open spaces.* Avoid all metal objects including electric wires, fences, machinery, motors, power tools, etc. Unsafe places include underneath canopies, small picnic or rain shelters, or near trees. Where possible, find shelter in a substantial building or in a fully enclosed metal vehicle such as a car, truck or a van with the windows completely shut. If lightning is striking nearby when you are outside, you should:
*A. **Crouch down**.* Put feet together. Place hands over ears to minimize hearing damage from thunder.
*B. **Avoid proximity*** (minimum of 15 ft.) to other people.
*3.**IF INDOORS...** Avoid water. Stay away from doors and windows. Do not use the telephone. Take off head sets.* Turn off, unplug, and stay away from appliances, computers, power tools, & TV sets. Lightning may strike exterior electric and phone lines, inducing shocks to inside equipment.
*4.**SUSPEND ACTIVITIES** for 30 minutes after the last observed lightning or thunder.*
*5.**INJURED PERSONS** do not carry an electrical charge and can be handled safely.* Apply First Aid procedures to a lightning victim if you are qualified to do so. Call 911 or send for help immediately.

MINNKOTA CYCLONE
NATIONAL WEATHER SERVICE

4797 Technology Circle
Grand Forks, ND 58203-0600

Phone: 701-772-0720
Fax: 701-772-0751

National Weather Service

We're on the web!
Http://www.crh.noaa.gov/fgf

Spotter Training Classes Coming to a Town Near You!

By Dan Riddle
Senior Meteorologist

Weather spotters across the eastern North Dakota and northwest and west central Minnesota provide the National Weather Service (NWS) with a wealth of information. Spotters help us verify our warnings and report real-time weather information so we can issue warnings and statements to the media and the public. Weather spotters include amateur radio operators, volunteer fire department personnel, city and county police and sheriff officers, and ordinary citizens who are interested in the weather.

Each year the NWS in Grand Forks trains thousands of spotters across our forecast area. Our goal is to have at least one class in each of our 37 counties. Much of this training occurs in the Spring months, prior to the severe weather season. It is important that each spotter attends one class each year to keep his or her weather spotting skills up to date.

For the Spring 2001 spotter training classes, the NWS has made several improvements to our presentation. One of those improvement is to include a section on winter storm spotting and what to report to the NWS during such winter events. Winter storms kill more people than summer storms in our area, on average, and the more information we can get about visibilities and snow accumulations the better we can warn the public. We also did a significant overall of our presentation graphics and included new and improved thunderstorm and tornado pictures. In addition, we now break up our presentation into a basic and an advanced section. The basic presentation goes through the basics of spotting, what and how to report your information, and general thunderstorm information. The advanced sections goes more in depth and really hits tornadoes, wall clouds and supercell storm structure. Most talks last about 2 to 2 **2** hours.

Here is a list of spotter classes (as of the end of March). Please contact your local county emergency manager for additional information on classes in your area.

April 24 - New Rockford, ND (6 pm)
May 1 - Finley, ND (730 pm)
May 2 - Park Rapids, MN
May 3 - Grafton, ND
May 7 - Grand Forks, ND
May 8 - Lakota, ND
May 19 - Fergus Falls, MN